

Southern Regional Soil Survey Conference

Field Trip

June 6, 2002

Geology/Geomorphology Overview:

In Georgia the Coastal Plain is divided into six topographic areas based on their geology. The Fall Line Hills join the Piedmont and are composed of Upper Cretaceous sands and clays. Both the Fort Valley Plateau in Peach County and the Louisville Plateau east of the Oconee River are composed of the Barnwell Formation, which is red clayey sands from the Eocene. The Dougherty Plain in Southwest Georgia is underlain by Ocala limestone and shows karst topography. The Tifton Upland occupies a broad band across the middle of the Georgia Coastal Plain and is composed of resistant sand and gravel from the Hawthorn Formation.

Along the Atlantic coast lie the Pleistocene coastal terraces. In order of age and elevation they are named Brandywine (270 ft.), Coharie (215 ft.), Sunderland (170 ft.), which are Pliocene in age, Wicomico (100 ft.), Penholoway (70 ft.), Talbot (42 ft.), Pamlico (25 ft.), Princess Anne (13 ft.), and Silver Bluff. These terraces are marine or estuarine in origin. They are mainly identified by their elevations, however some remnant beach ridges and dunes can rise higher than the remnant shoreline. Sediment textures range from sand to clay depending on the depositional environment. These terraces presumably were formed in the interglacials of the Pleistocene.

Tybee Island lies on the Holocene Shoreline Complex. Skidaway Island and Wilmington Island lie on the Princess Anne Terrace which is approximately 100,000 years old. Savannah lies primarily on the Pamlico Terrace which has been correlated as Wisconsinian in age. It is a wide formation (20 to 25 miles) and extends all along the shore of Georgia in broad sinuous arcs. It is composed of mainly sands and clays.

The area between Rincon and Savannah is on the Talbot Terrace. Not much is known about the character of the Talbot, since it is very thin in Georgia and hard to distinguish. Where the Talbot is seen, it is composed of mainly sand and sandy clay.

The Rincon area is situated on the Penholoway Terrace. This formation extends across the Coastal Plain from Effingham County to Charlton County. It is composed almost entirely of quartz sand. No fossils have been found in the Penholoway.

Soils:

The Atlantic Coast of Georgia has a wide range of soil conditions, and properties vary with composition, surface age, and elevation and drainage. Older higher surfaces are dominantly Kandicudults and Paleudults. On lower surfaces nearer the coast, Alaquods, Alorthods, Quartzipsamments, and Psammaquents are found on sandy barrier island facies of the coastal terraces. On marsh and lagoonal facies, Endoaquults and Endoaquualfs dominate. Small areas of Histosols and soils with histic epipedons occur along drainageways and shallow depressions

scattered throughout the area. The soils we will be observing on this trip are on the shoreline facies of the Penholoway terrace (sandy parent materials).

The Holocene barrier islands are dominantly Alaquods, Alorthods, and Quartzipsamments and the back barrier salt marsh dominated by Sulfaquents. Histosols are not common in the salt marsh because tidal velocities associated with the 6-8' tidal range exports most of the organic matter out to sea and precludes organic matter accumulation.

Water Table Studies:

In December, 1994, piezometers were installed at five locations along a hillslope transect to evaluate soil hydric status as related to morphology and confirm classification. Soils were described and sampled from bucket auger borings. Depth to free water in the piezometers and rainfall at the site was monitored weekly until March, 2000. Water table depths throughout the monitoring period and in relation to the landscape are shown in the following graphs.

Annual precipitation measured at the site over the five years of monitoring is given in Table 1. The years 1995, 1997, and 1999 received above average rainfall, and rainfall in 1996 was considerably below average. The rainfall amounts are generally expressed in water table depth trends.

Table 1. Annual precipitation measured at the piezometer hillslope. Mean annual rainfall at the Savannah airport is 1224 mm (1961-1990 measurement period).

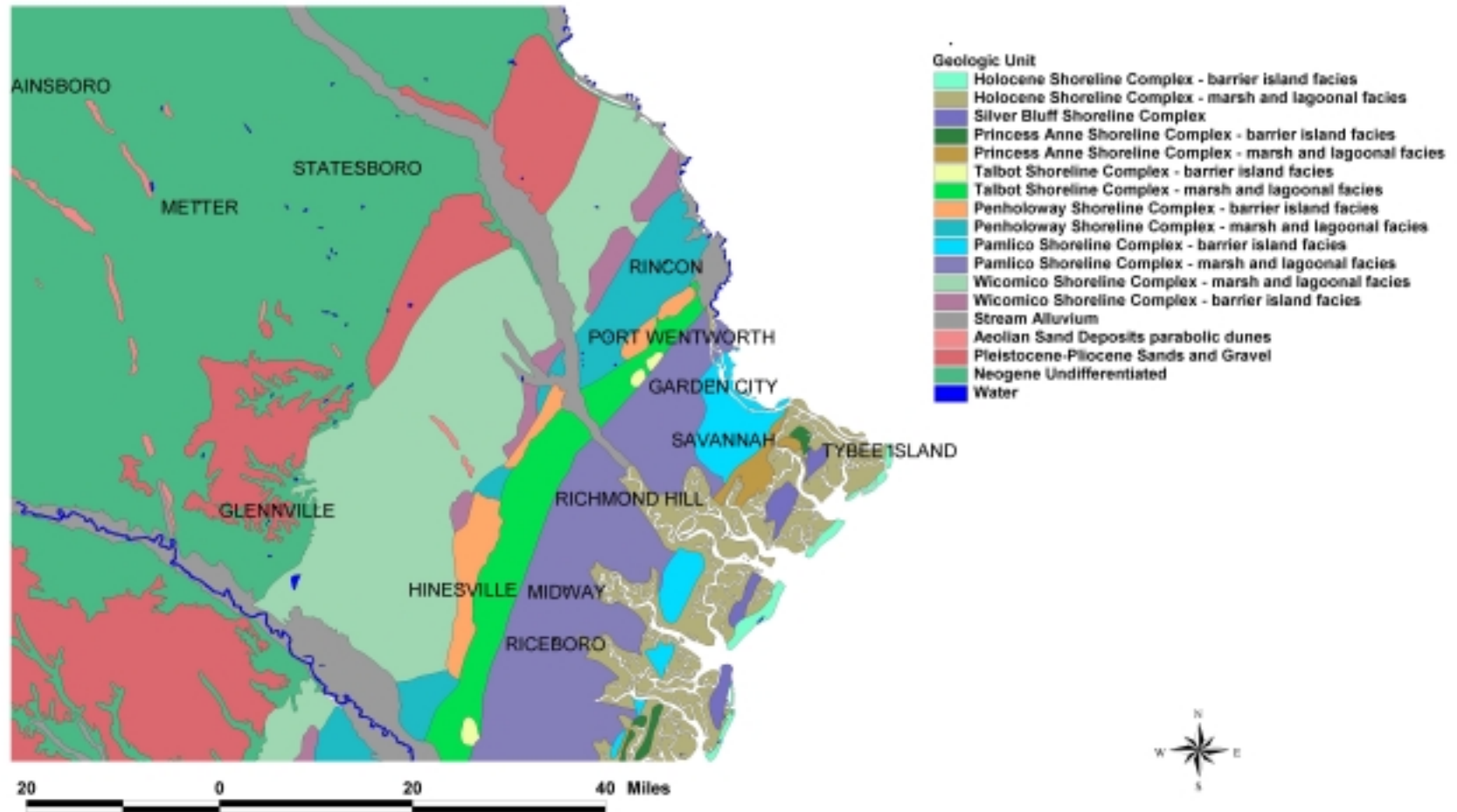
Year	Annual Precipitation
	mm
1995	1450
1996	1015
1997	1369
1998	1235
1999	1314

As would be expected, depth to saturation varied seasonally and with position on the landscape. Table 2 gives the percentage of monitoring dates that had saturated conditions in various horizons of the five sites. Detailed analysis of duration and season as related to horizon morphology have not been completed.

Table 2. Percentage of monitoring dates with water table above lower horizon boundary.

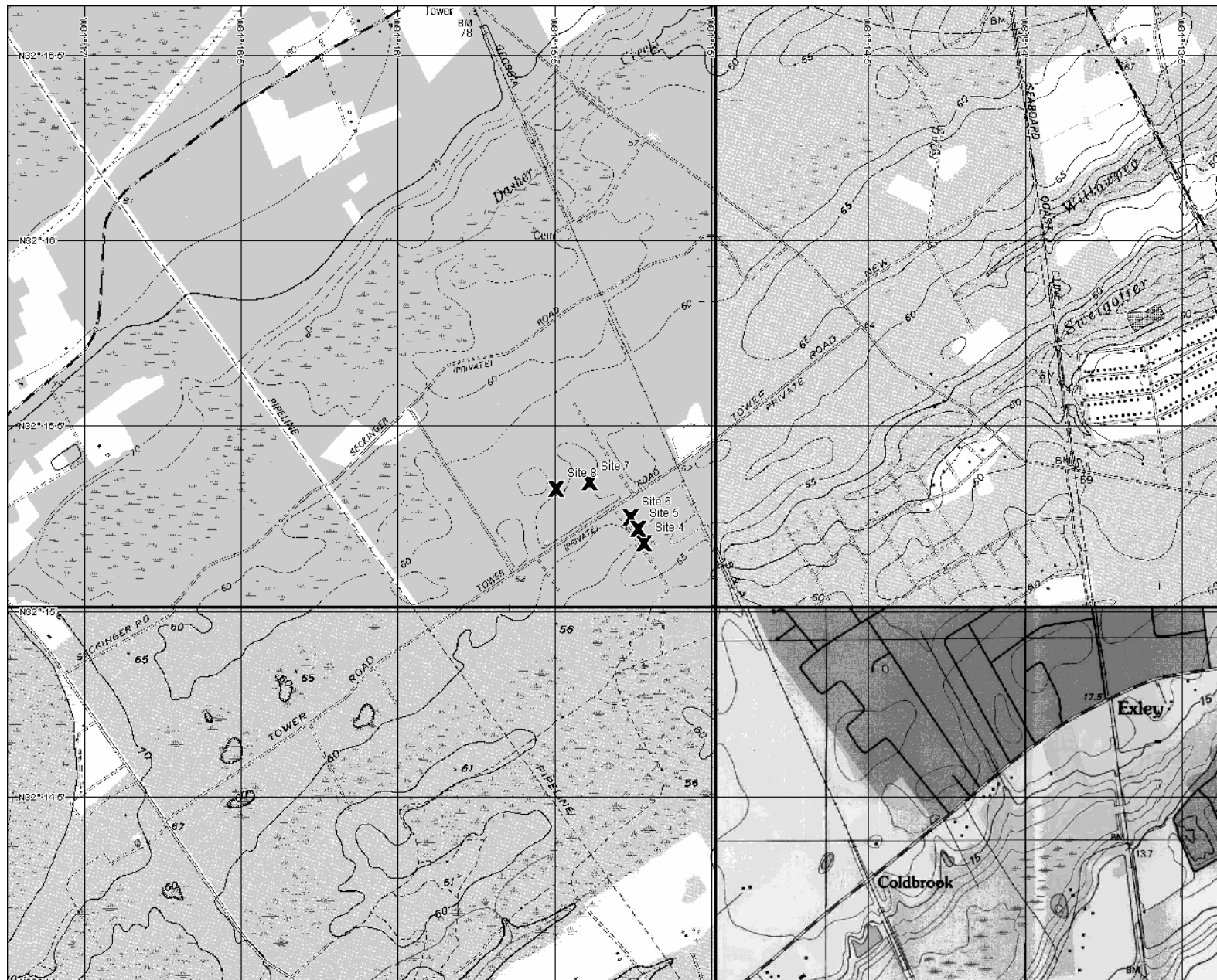
Site	Horizon	Lower Boundary Depth cm	Percentage of Monitoring Dates with Water Table Above Lower Horizon Boundary
4	Oa	18	39
	A	25	43
	BA	81	75
5	A	23	28
	A/E	46	45
	Eg1	74	60
6	Bh	38	11
	E1	71	24
	E2	112	53
	B'h1	140	70
7	Bh	36	13
	E	127	71
	B'h	175	87
8	A1	36	43
	A2	56	62
	AB	81	72

Georgia Coastal Geology

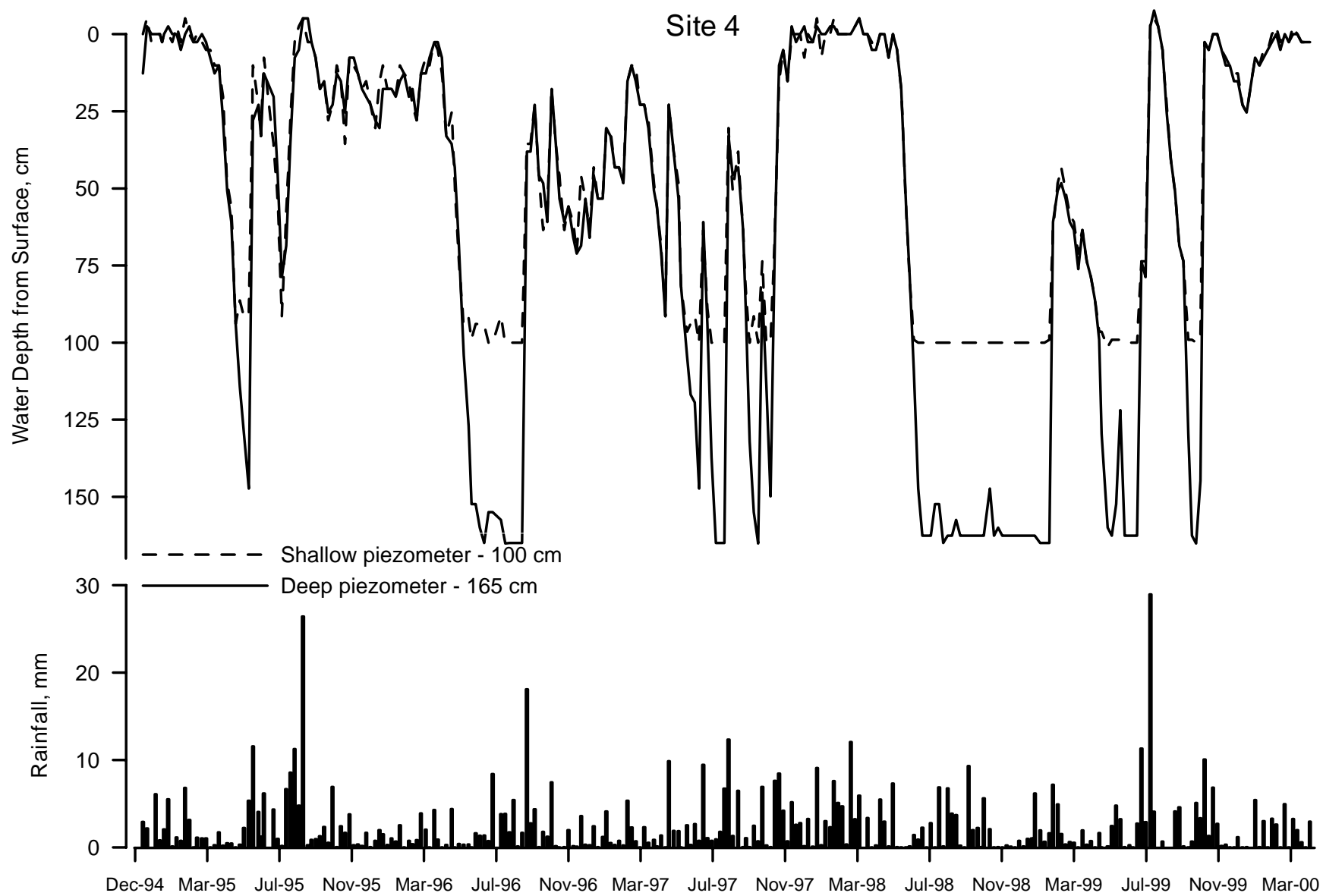


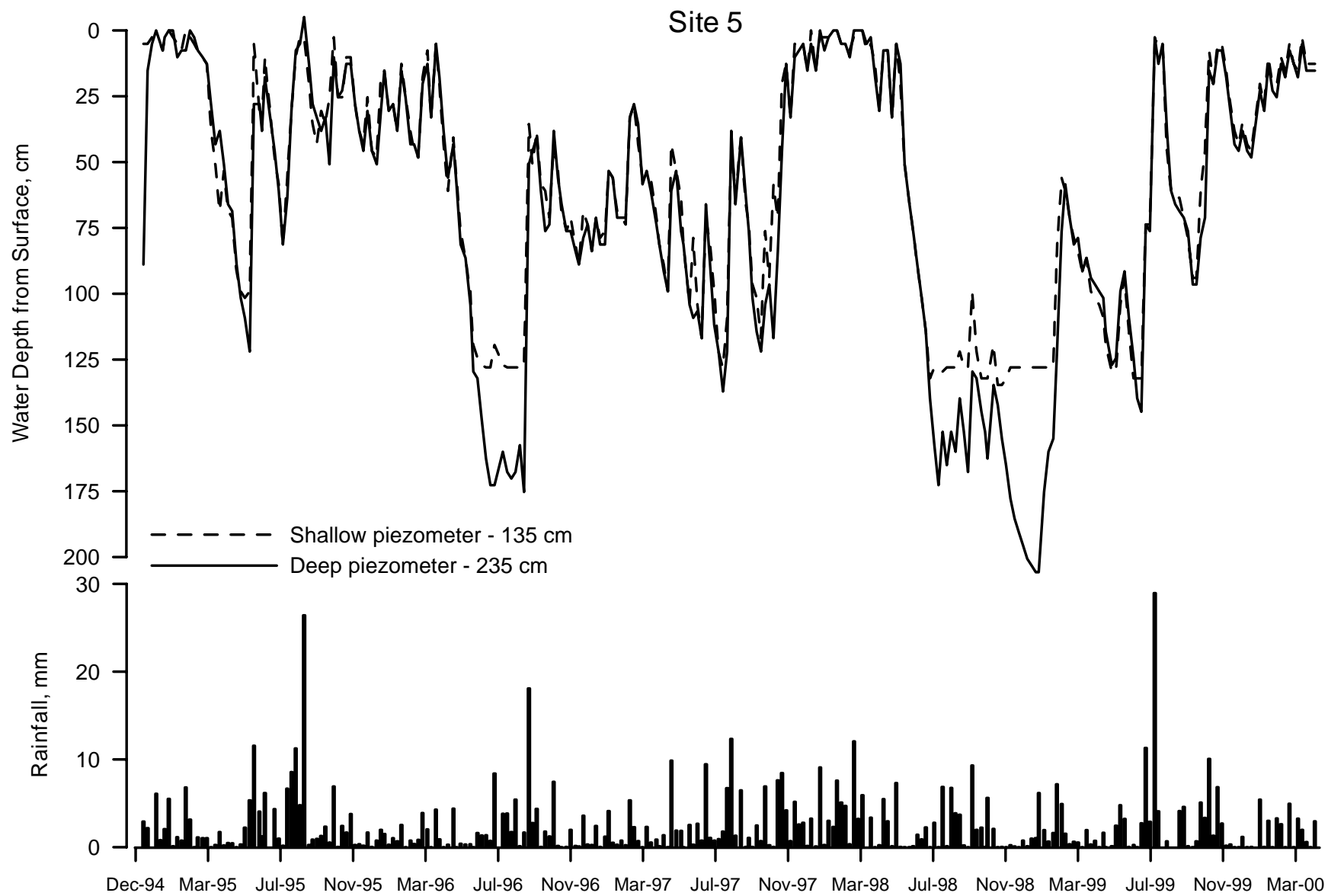


1-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 1 mi Scale: 1 : 225,000 Detail: 30-0 Datum: WGS84

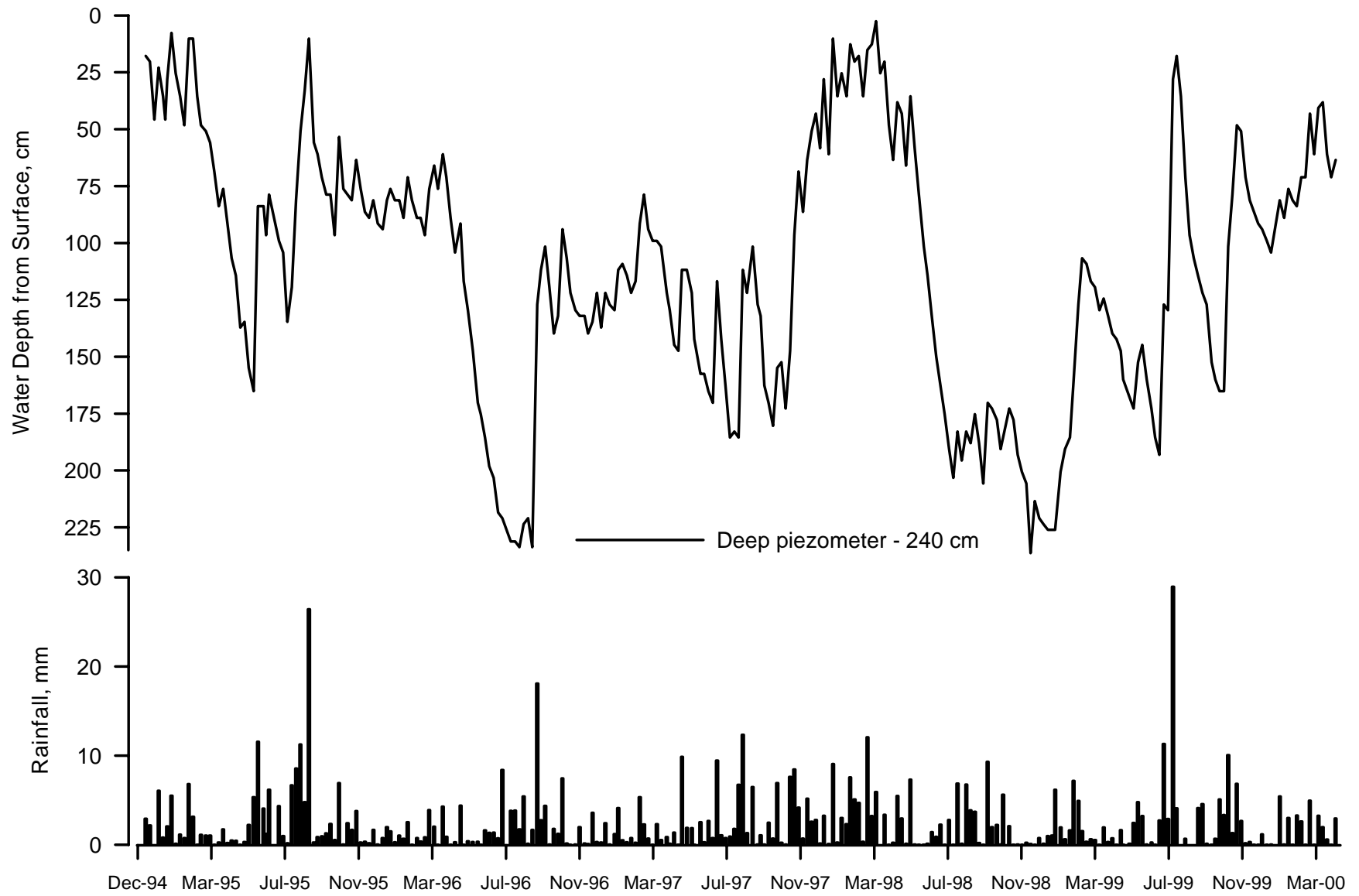


3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS 742 ft Scale: 1 : 25,000 Detail: 13-0 Datum: WGS84

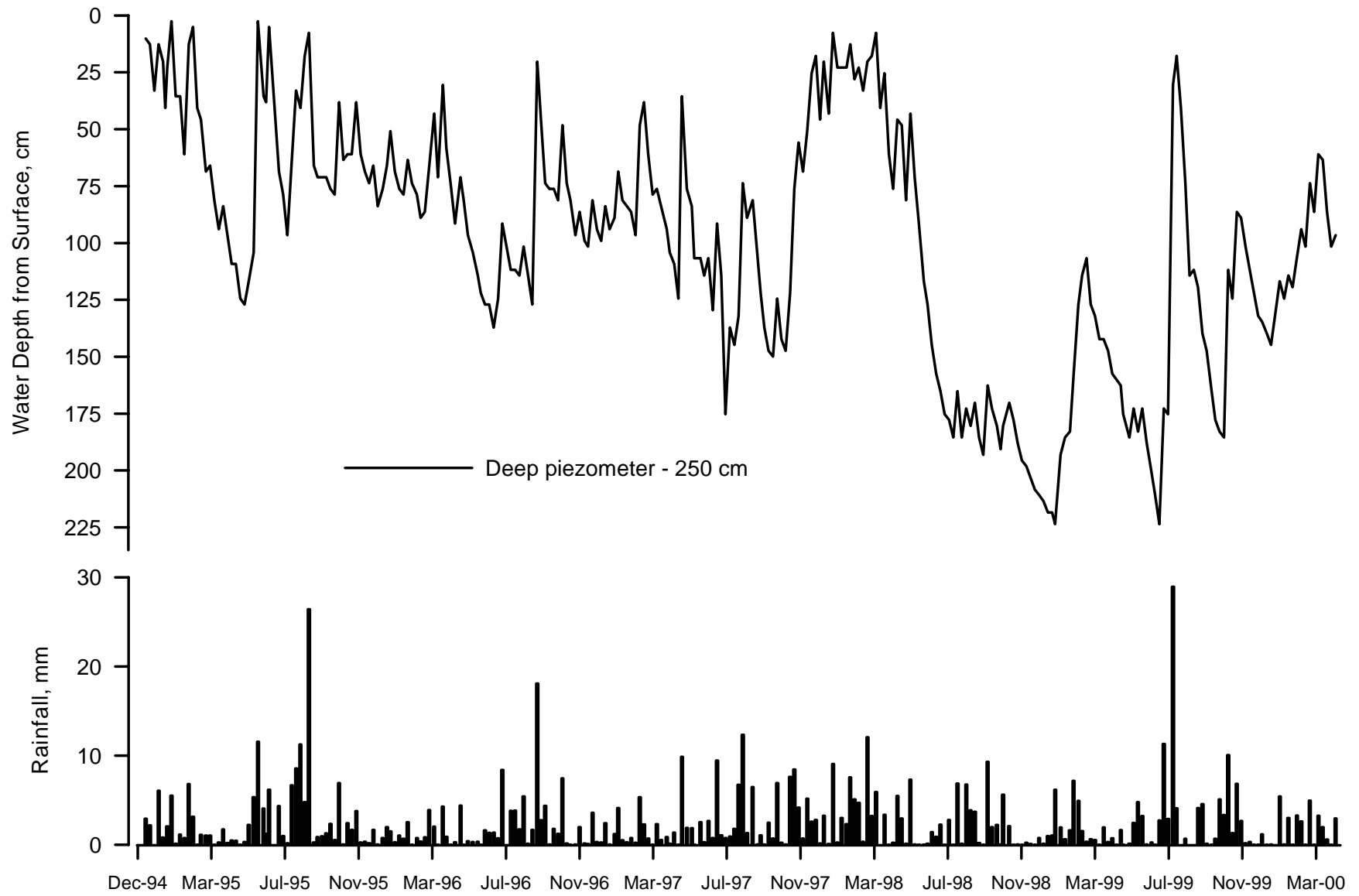


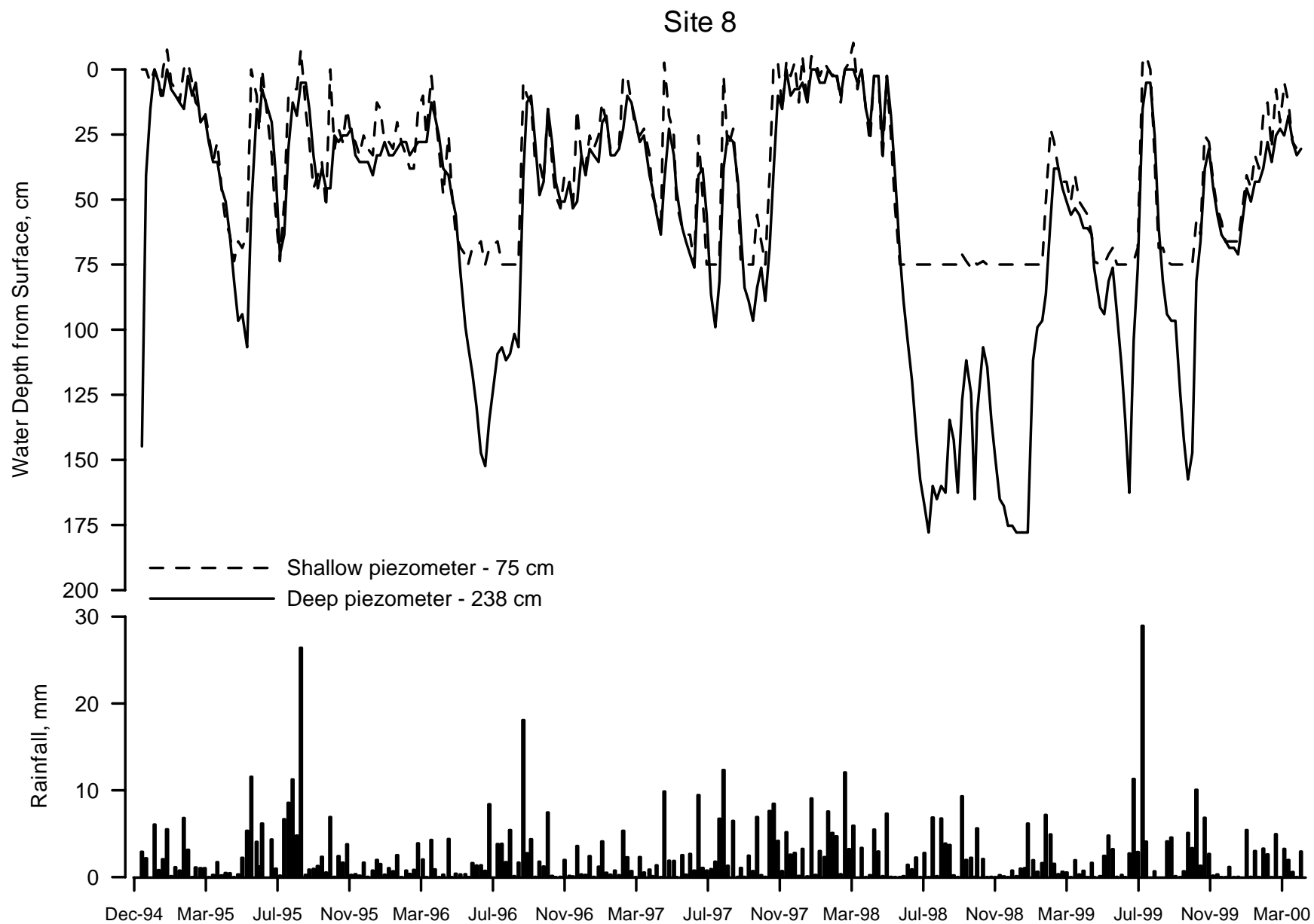


Site 6

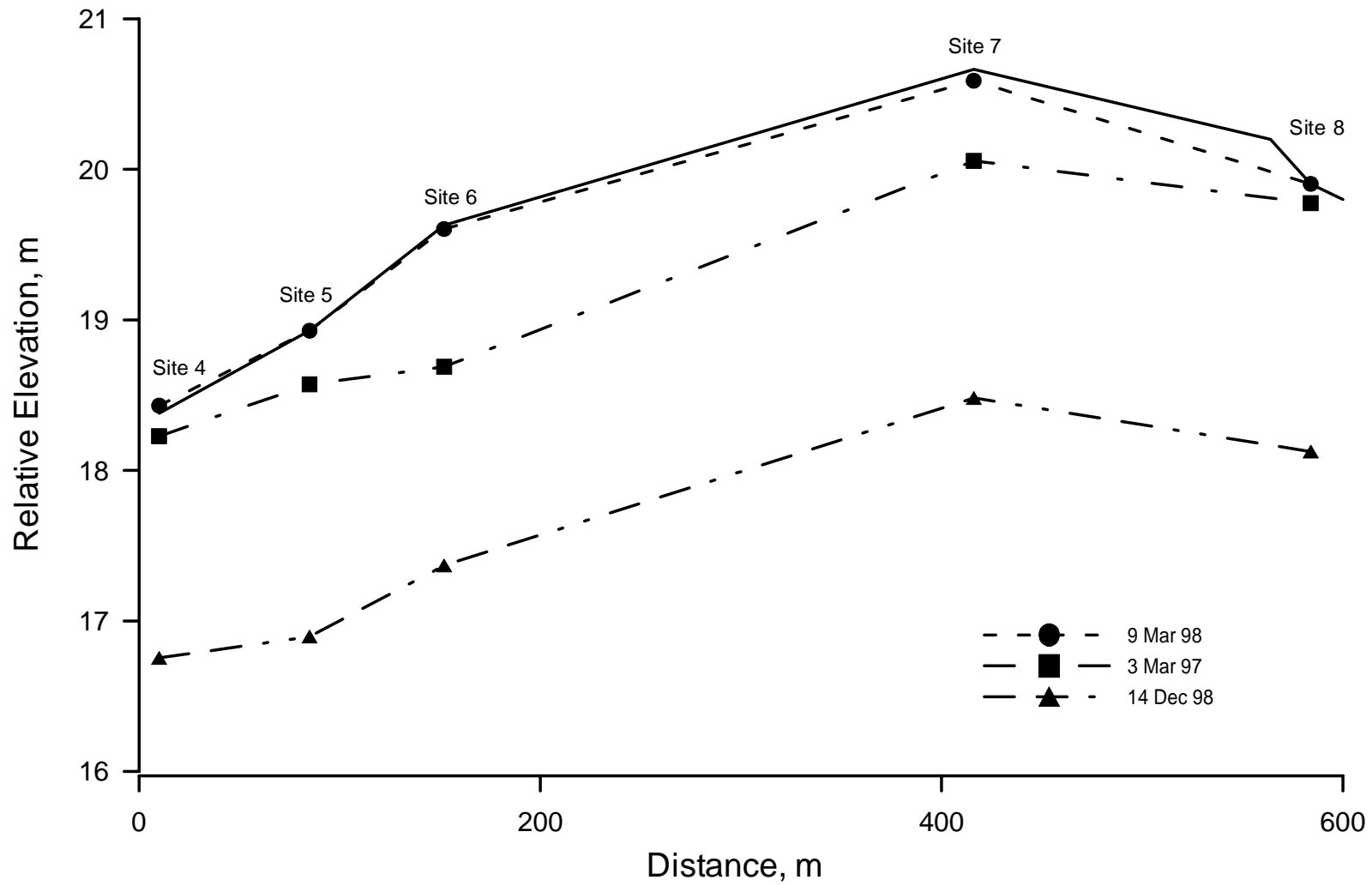


Site 7





Effingham County Well Transect
Deep Piezometers
Vertical Exaggeration = 15X



Site 4: Bayboro (sampled as)

Taxonomic class: fine-loamy, mixed, thermic Umbric Paleaquults

Pedon description: (colors are for moist soils)

Oa - 0 to 18 cm; black (10YR 2/1) decomposed leaves, twigs and sphagnum moss; less than 30% fibrous material.

A - 18 to 25 cm; very dark grayish brown (10YR 3/2) sandy loam; weak fine granular structure; friable; many fine and medium large roots; clear smooth boundary.

BAg - 25 to 81 cm; grayish brown (10YR 5/2) sandy clay loam; weak fine subangular blocky structure; friable; few faint clay films on faces of peds; common fine and medium roots; common fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; gradual smooth boundary.

Btg1 - 81 to 127 cm; grayish brown (10YR 5/2) sandy clay; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; few medium and large roots; gradual wavy boundary.

Btg2 - 127 to 165+ cm; brown (7.5YR 5/2) clay; strong medium subangular blocky structure; very firm; common prominent clay films on faces of peds; few medium roots.

Pedon location: Effingham County, GA. (EF-4) 0.9 mile southwest on Tower road from McCall road intersection; from Tower road and Smokehouse road intersection; 160 degrees and 690 feet from ditch on south side of road at Tower road and Smokehouse road intersection (USGS Quadrangle, Springfield South, GA (1978)); lat:32 degrees 15 min 11 sec N and 81 degrees 15 min and 12.4 sec W.)

Site 5: Plummer

Taxonomic class: loamy, siliceous, thermic Grossarenic Paleaquults

Pedon description: (colors are for moist soil).

Oi - 1 to 0 cm; decomposing needles, leaves and twigs; many fine and medium and common large roots.

Ap - 0 to 23 cm; black (2.5Y 2/0) sand; single grained; loose; many fine and medium large roots; clear smooth boundary.

A/E - 23 to 46 cm; grayish brown (10YR 5/2) (E) and very dark gray (10YR 3/1) (A) sand; single grain; loose; common fine and medium roots; few fine oxidized rhizospheres; gradual smooth boundary.

Eg1 - 46 to 74 cm; grayish brown ((10YR 5/2) sand; single grained; loose; common fine and medium roots; coarse organic streaks; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; clear smooth boundary.

Eg2 - 74 to 91 cm; light gray (10YR 7/2) sand; single grained; loose; common fine and medium roots; coarse very dark grayish brown (10YR 3/2) mottles; organic streaks; clear smooth boundary.

Eg3 - 91 to 145 cm; pinkish gray ((7.5YR 6/2) loamy sand; common coarse distinct light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; very friable; few fine and medium roots; clear smooth boundary.

Btg - 145 to 206 cm; light gray (10YR 7/2) sandy clay loam; moderate medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine flakes of mica; common fine prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; gradual smooth boundary.

BCg - 206 to 234 cm; light gray (10YR 7/2) sandy clay loam; weak medium subangular blocky structure; friable; few faint clay films on faces of peds; many fine flakes of mica; common medium prominent brown (7.5YR 5/2) iron depletions.

Pedon location: Effingham County, (EF-5); 0.9 mile southwest on Tower road from McCall road intersection, to Tower road and Smokehouse road intersection; 170 degrees and 444 feet from ditch on southside of road. (USGS Quadrangle, Springfield South, GA (1978)); lat: 32 degrees 15 minutes 13.30 sec N. long: 81 degrees 15 minutes 14 sec W.)

Site 6: Rigdon (sampled as)

Taxonomic class: sandy, siliceous, thermic Oxyaquic Alorthods

Pedon description: (colors are for moist soil).

Ap - 0 to 20 cm; very dark gray (10YR 3/1) sand; weak fine granular structure; very friable; common fine, medium and large roots; clear smooth boundary.

Bh - 20 to 38 cm; dark reddish brown (5YR 2.5/2) loamy sand; weak fine subangular blocky structure; very friable; common fine and medium roots; clear smooth boundary.

E1 - 38 to 71 cm; grayish brown (10YR 5/2) sand; common coarse dark gray (10YR 4/1) organic stains; loose; few fine and medium roots; few fine oxidized rhizospheres around live roots; gradual smooth boundary.

E2 - 71 to 112 cm; light gray (10YR 7/2) sand; single grained and weak coarse subangular blocky structure; loose; few fine and medium roots; moderate medium distinct brownish yellow (10YR 6/6) masses of iron accumulation; clear smooth boundary.

B'h1 - 112 to 140 cm; dark reddish gray (5YR 4/2) loamy sand; weak fine subangular blocky structure; very friable; few fine and medium roots; few fine prominent brownish yellow (10YR 6/8) masses of iron accumulation and few fine distinct grayish brown (10YR 5/2) iron depletions; gradual smooth boundary.

B'h2 - 140 to 206 cm; reddish gray (5YR 5/2) loamy sand; weak fine granular structure; very friable; common medium distinct dark brown (7.5YR 4/2) masses of iron accumulations; clear smooth boundary.

C - 206 to 224 cm; pinkish gray (7.5YR 7/2) sand; single grain; loose; few fine mica flakes.

Pedon location: Effingham County, GA, (EF-6) 0.9 mile southwest on Tower road from Tower road and McCall road intersection, to Tower road and Smokehouse road intersection; 170 degrees; 223 feet from ditch on south side of road. (USGS Quadrangle, Springfield South, GA (1978)); lat. 32 deg 15 min 15.20sec, N. and long. 81 deg 15 min and 15.80 sec W.) May be better classified as sandy, siliceous, thermic

Site 7: Rigdon (sampled as)

Taxonomic class: sandy, siliceous, thermic Oxyaquic Alorthods

Pedon description: (colors are for moist soil).

Ap - 0 to 18 cm; black (10YR 2/1) sand; weak fine granular structure; very friable; common fine and medium roots; clear smooth boundary.

Bh - 18 to 36 cm; very dark gray (5YR 3/1) sand; weak fine granular structure; very friable; common fine and medium dead roots; clear smooth boundary.

E - 36 to 127 cm; light gray (10YR 7/2) sand; single grained; loose; few fine and medium dead roots; few fine prominent brownish yellow (10YR 6/8) masses of iron accumulation and many medium distinct gray (10YR 5/1) iron depletions; clear smooth boundary.

B'h - 127 to 175 cm; dark reddish gray (5YR 4/2) sand; weak fine granular structure; very friable; gradual wavy boundary.

C - 175 to 249 cm; pinkish gray (7.5YR 6/2) sand; single grained; loose; few medium distinct dark reddish gray (5YR 4/2) bodies of Bh; few fine prominent brownish yellow (10YR 6/8) masses of iron accumulation.

Pedon location: Effingham County, GA, (EF-7) 0.9 mile southwest on Tower road from Tower road and McCall road intersection, to Tower road and Smokehouse road intersection; north of intersection 334 degrees and 614 feet on Smokehouse road; west of Smokehouse road ditch 240 degrees and 353 feet to one year old planted loblolly pine plantation. (USGS Quadrangle, Springfield South, GA (1978)); lat. 32 deg 15 min 21.20 sec, N. and long. 81 deg 15 min and 23.40 sec W.)

Site 8: No Series Designated

Taxonomic class: fine-loamy, mixed, thermic Typic Umbraquults

Typical pedon: mucky sand forested (colors are for moist soil).

Oi- 0 to 3 cm; black (N 2/0); 80% fibrous material; gradual smooth boundary.

A1 - 3 to 36 cm; black (N 2/0) mucky sand; many fine and medium roots; gradual smooth boundary.

A2 - 36 to 56 cm; black (10YR 2/1) mucky sand; few medium distinct gray (10YR 5/1) mottles; weak medium granular structure; very friable; many fine and medium roots; gradual smooth boundary.

AB- 56 to 81 cm; very dark gray (10YR 3/1) mucky loamy sand; weak medium granular structure; very friable; common fine and medium and large roots; clear smooth boundary.

Btg1- 81 to 117 cm; dark gray (5YR 4/1) sandy loam; common medium faint gray (5YR 5/1) iron depletions; moderate medium subangular blocky structure; very firm (firm disturb); clay bridging between sand grains; common fine and medium roots; clear smooth boundary.

Btg2 - 117 to 155 cm; dark reddish gray (5YR 4/2) sandy loam; common medium distinct gray (5YR 6/1) iron depletions; moderate medium subangular blocky structure; very firm; clay bridging between sand grains; common fine and medium roots.

BCg -119 to 160cm; dark reddish brown (5YR 3/2) loamy sand; weak medium subangular blocky structure; very friable; few fine and medium roots; common fine distinct light gray (5YR 7/1) and reddish gray (5YR 5/2) iron depletions; gradual smooth boundary.

Cg -160 to 221cm; pinkish gray (5YR 6/2) sand; single grained; loose; few fine and medium roots; common coarse distinct dark reddish gray (5YR 4/2) iron depletions.

Pedon location: Effingham County, GA (EF-8) 0.9mile southwest on Tower road from Tower road and McCall road intersection, to Tower road and Smokehouse road intersection; north of intersection 334 degrees and 614 feet on Smokehouse road; from ditch, 251 degrees and 883 feet to upland bay; (USGS Quadrangle, Springfled South, GA. (1978); lat. 32 degrees 15 min 20 sec N., long. 81 deg 15 min 29.70 sec W.)

GEORGIA AGRICULTURAL EXPERIMENT STATION
SOIL CHARACTERIZATION LABORATORY

Series: Site 4

Pedon: S93GA079004

Location: Effingham County, GA

Date: July, 1995

USDA Particle-Size Distribution											
Lab.			sand								Text.
No.	Horizon	Depth	vc	c	m	f	vf	t	silt	clay	Class
		cm	-----%								
2294	A	18 - 25	0.4	3.8	13.0	21.8	13.1	52.1	27.1	20.8	scl
2295	Btg1	25 - 81	0.3	3.1	13.1	31.1	4.3	51.9	28.5	19.6	l
2296	Btg2	81 - 127	0.3	3.2	12.7	26.6	6.3	49.1	22.3	28.6	scl
2297	Btg3	127 - 165	0.4	2.8	11.5	26.8	3.3	44.8	21.6	33.6	cl

Horizon	Depth cm	pH	Org. C %	Extractable Cations					CEC pH 7	Base Sat. %
				Ca	Mg	Na	K	SUM		
				-----cmol (+)/kg-----						
A	18 - 25	3.9	1.65	0.0	0.0	0.1	0.0	0.1	6.9	2
Btg1	25 - 81	3.7	0.61	0.0	0.1	0.0	0.0	0.2	3.9	4
Btg2	81 - 127	3.6	0.71	0.0	0.2	0.1	0.1	0.4	5.5	7
Btg3	127 - 165	3.7	0.65	0.2	0.6	0.1	0.1	1.0	8.5	12

Series: Site 5

Pedon: S93GA079005

Location: Effingham County, GA

Date: July, 1995

Lab. No.	Horizon	Depth cm	USDA Particle-Size Distribution								Text. Class
			sand						silt	clay	
			vc	c	m	f	vf	t			
			-----%								
2298	Ap	0 - 23	0.5	8.3	25.9	50.0	4.5	89.2	8.9	1.9	fs
2299	A/E	23 - 46	0.7	9.7	28.1	46.8	4.9	90.2	8.7	1.1	s
2300	E1	46 - 74	0.7	9.9	28.0	48.1	2.6	89.3	9.4	1.3	s
2301	E2	74 - 91	0.7	9.3	27.0	41.0	7.7	85.7	11.4	2.9	ls
2302	E3	91 - 145	0.5	9.2	27.2	43.0	4.8	84.7	10.6	4.7	ls
2303	Btg	145 - 206	3.3	13.5	15.5	30.2	1.6	64.1	5.7	30.2	scl
2304	BC	206 - 234	0.9	8.8	7.8	47.8	3.3	68.6	6.3	25.1	scl

Horizon	Depth cm	pH	Org. C %	Extractable Cations					CEC pH 7	Base Sat. %
				Ca	Mg	Na	K	SUM		
				-----cmol (+)/kg-----						
Ap	0 - 23	2.9	3.16	0.1	0.0	0.0	0.0	0.2	2.96	6
A/E	23 - 46	3.8	0.03	0.1	0.0	0.0	0.0	0.2	0.82	19
E1	46 - 74	3.6	1.41	0.0	0.0	0.0	0.0	0.0	0.62	6
E2	74 - 91	3.9	0.63	0.1	0.0	0.0	0.0	0.1	0.43	32
E3	91 - 145	4.1	0.03	0.0	0.0	0.0	0.0	0.1	1.12	7
Btg	145 - 206	3.9	0.46	0.2	0.7	0.1	0.1	1.1	4.69	24
BC	206 - 234	4.0	0.31	0.2	0.7	0.1	0.2	1.1	4.24	27

GEORGIA AGRICULTURAL EXPERIMENT STATION
SOIL CHARACTERIZATION LABORATORY

Series: Site 6

Pedon:S93GA079006

Location: Effingham County, GA

Date: July, 1995

Lab. No.	Horizon	Depth cm	USDA Particle-Size Distribution									Text. Class
			sand						silt	clay		
			vc	c	m	f	vf	t				
			-----%									
2305	Ap	0 - 20	0.2	5.0	24.5	54.8	5.3	89.8	7.7	2.5	fs	
2306	Bh	20 - 38	0.1	4.4	22.7	58.1	4.1	89.4	7.9	2.7	fs	
2307	E1	38 - 71	0.4	5.2	25.5	53.6	7.1	91.8	7.1	1.1	fs	
2308	E2	71 - 112	0.4	4.5	23.2	54.4	3.1	85.6	6.9	7.5	lfs	
2309	Bh'1	112 - 140	0.4	6.8	32.1	49.8	2.2	91.3	7.6	1.1	s	
2310	Bh'2	140 - 206	0.2	5.1	28.4	54.8	3.3	91.8	7.5	0.7	fs	

Horizon	Depth	pH	Org. C	Extractable Cations					CEC pH 7	Base Sat.
				Ca	Mg	Na	K	SUM		
				%	-----cmol (+)/kg-----					%
Ap	0 - 20	3.93	1.38							
Bh	20 - 38	4.40	1.33							
E1	38 - 71	5.78	0.21							
E2	71 - 112	4.55	0.01							
Bh'1	112 - 140	4.30	0.02							
Bh'2	140 - 206	4.91	0.12							

Series: Site 7

Pedon:S93GA079007

Location: Effingham County, GA

Date: July, 1995

Lab. No.	Horizon	Depth cm	USDA Particle-Size Distribution									Text. Class
			sand						silt	clay		
			vc	c	m	f	vf	t				
-----%												
2311	Ap	0 - 18	0.2	2.2	25.6	54.6	4.2	86.8	8.6	4.6	lfs	
2312	Bh	18 - 36	0.1	2.0	23.4	54.6	6.3	86.4	10.7	2.9	lfs	
2313	E2	36 - 147	0.1	2.5	26.8	52.9	2.6	84.9	8.7	6.4	lfs	
2314	B'h	147 - 175	0.0	2.2	27.9	53.5	3.6	87.2	10.8	2.0	fs	
2315	C	175 - 249	0.0	1.5	30.2	52.7	6.4	90.8	8.3	0.9	fs	

Horizon	Depth	pH	Org. C	Extractable Cations					CEC pH 7	Base Sat.
				Ca	Mg	Na	K	SUM		
				-----cmol (+)/kg-----						
Ap	0 - 18	4.16	2.66							
Bh	18 - 36	4.65	1.12							
E2	36 - 147	3.97	0.57							
B'h	147 - 175	4.27	0.48							
C	175 - 249	4.79	0.11							

GEORGIA AGRICULTURAL EXPERIMENT STATION
SOIL CHARACTERIZATION LABORATORY

Series: Site 8
Location: Effingham County, GA

Pedon: S93GA079008
Date: July, 1995

Lab. No.	Horizon	Depth cm	USDA Particle-Size Distribution									Text. Class
			sand						silt	clay		
			vc	c	m	f	vf	t				
-----%-----												
2316	Oa	3 - 36	0.4	3.4	18.1	35.4	3.3	60.6	24.1	15.3	fsl	
2317	A	36 - 56	0.2	3.1	19.7	39.5	6.8	69.3	19.5	11.2	fsl	
2318	AB	56 - 81	0.2	3.0	18.8	41.0	4.1	67.1	20.2	12.7	fsl	
2319	Btg1	81 - 117	0.3	2.8	17.8	25.4	12.3	58.6	16.9	24.5	fsl	
2320	Btg2	117 - 155	0.2	2.9	19.6	36.4	6.3	65.4	14.8	19.8	fsl	

Horizon	Depth cm	pH	Org. C %	Extractable Cations						CEC pH 7	Base Sat. %
				Ca	Mg	Na	K	SUM			
				-----cmol (+)/kg-----							
A1	3 - 36	3.29	7.67	0.00	0.04	0.05	0.05	0.1	27.29	1	
A2	36 - 56	3.39	2.87	0.10	0.02	0.04	0.03	0.2	9.37	2	
AB	56 - 81	3.70	2.35	0.44	0.02	0.04	0.04	0.5	7.03	8	
Btg1	81 - 117	3.56	1.03	0.00	0.02	0.06	0.04	0.1	8.12	1	
Btg2	117 - 155	3.62	0.46	0.00	0.01	0.08	0.03	0.1	6.47	2	